

CLAIMS

What is claimed is:

1. A programmable apparatus for receiving instructions from a programmer and causing an action to occur on the happening of an event, comprising:

an input device, producing an input instruction signal;

a control means for receiving said input instruction signal, and storing a program instruction associated with said input instruction signal, said control means storing sufficient program instructions to perform an action on the occurrence of an event, said control means monitoring a status of said apparatus to determine the occurrence of various events, comparing the determined events with the program instructions, and performing said action on the occurrence of said event;

a display means for interactively displaying information related to the instructions to be received, and responsive thereto, controlled by said control means, so that the programmer is presented with feedback on a current state of the apparatus and said program instruction;

wherein said control means further comprises means for detecting one or more characteristics of said input instruction signal independent of said program instruction selected from the

group consisting of a velocity component, an efficiency of input, an accuracy of input, an interruption of input, a high frequency component of input and a past history of input by the programmer, whereby when said control means detects a characteristic indicating that said display means is displaying information in a suboptimal fashion, said control means controls said display means to display information in a more optimal fashion.

2. A programmable apparatus for receiving instructions from a programmer and causing an action to occur on the happening of an event, comprising:

an input device, producing an input instruction signal;

a control means for receiving said input instruction signal, and storing a program instruction associated with said input instruction signal, said control means storing sufficient program instructions to perform an action on the occurrence of an event, said control means monitoring a status of said apparatus to determine the occurrence of various events, comparing the determined events with the program instructions, and performing said action on the occurrence of said event;

a display means for interactively displaying information related to the instructions to be received, and responsive thereto, controlled by said control means, so that the programmer is presented with feedback on a current state of the apparatus and said program instruction;

wherein said control means further comprises means for detecting a need by the programmer for more detailed information displayed on said display means, by detecting one or more characteristics of said input instruction signal independent of said program instruction selected from the group consisting of a velocity component, an efficiency of input, an accuracy of input, an interruption of input, a high frequency component of input and a past history of input by the programmer, whereby when said control means detects a characteristic indicating that said display means is insufficiently detailed information, said control means controls said display means to display more detailed information.

3. A programmable apparatus having a data input, said apparatus receiving instructions from a programmer and causing an action to occur on the receipt of data indicating an event, comprising:

an input device, producing an input instruction signal;

a control means for receiving said input instruction signal, and storing a program instruction associated with said input instruction signal, said control means storing sufficient program instructions to perform an action on the receipt of data indicating an event, said control means monitoring the data input;

a display means for interactively displaying information related to the instructions to be received, and responsive thereto, controlled by said control means, so that the

programmer is presented with feedback on a current state of the apparatus and said program instruction;

wherein said control means receives a programming preference indicating a desired event from said input device which does not unambiguously define said event, and said control means monitors said data and causes the occurrence of the action when a correlation between said programming preference and said monitored data is above a predetermined threshold, indicating a likely occurrence of said desired event.

4. The programmable apparatus according to claim 3, wherein said input device is remote from said display means, and provides a direct manipulation of display information of said display means, further comprising means for verifying said program instructions so that said program instructions are executable by said control means.

5. The programmable apparatus according to claim 3, wherein said control means further comprises a calendar.

6. The programmable apparatus according to claim 3, wherein said control means provides an option, selectable by said input means in conjunction with said display means, for changing an input program instruction prior to execution by said control means, so that said apparatus enters a state wherein a new program instruction may be input to substitute for said changed input step, wherein said control means verifies said program instructions so

that said program instructions are executable by said control means.

7. The programmable apparatus according to claim 3, wherein said control means further causes said display means to display a confirmation screen after said program instructions are input, so that the programmer may confirm said program instructions.

8. A programmable information storage apparatus having a data input, for receiving data to be stored, said apparatus receiving instructions from a programmer and causing an action to occur on the receipt of data indicating an event, comprising:

means for storing data from said data input;

an input device, producing an input instruction signal;

a control means for receiving said input instruction signal, and storing a program instruction associated with said input instruction signal, said control means storing sufficient program instructions to perform an action on the receipt of data from said data input indicating an event, said control means monitoring the data input to determine the occurrence of various events, comparing the determined events with the program instructions, and performing for storing the data said action on the occurrence of said event;

wherein said control means receives identifying data from at least one of said input device and the data input, said

without entering data into said controller through said input device relating to both said action and said event;

said display also comprising means for indicating completion of a programming step after entry of data, which means will not allow the user to indicate to said controller that said programming step is completed if information necessary for execution of said step is not available to said controller; and

said controller being capable of controlling said display device to present information to the user relating to the use of the apparatus if necessary for use of the device by the user.

15. A system for presenting a program to a viewer, comprising:

a source of program material;

means for determining a viewer preference;

means for receiving the program material from said source;

means for characterizing the program material based on its content;

means for correlating said characterized content of the program material with said determined viewer preference to produce a correlation index; and

means for presenting the program material to the viewer, if said correlation index indicates a probable high correlation between said characterization of the program material and said viewer preference.

16. The system according to claim 15, wherein said program material is encrypted, further comprising:

means for decrypting the program material to produce a decryption event; and

means for charging an account of the viewer based on the occurrence of a decryption event.

17. The system according to claim 16, wherein said means for characterizing the program material may operate without causing a decryption event.

18. The system according to claim 16, further comprising a memory for storing the program material while said characterizing means produces characterized content and said correlating means produces said correlation index.

19. The system according to claim 18, wherein said characterizing means characterizes the program material stored in memory.

20. The system according to claim 19, wherein the program material stored in memory is compressed.

21. A system for presenting a program to a viewer, comprising:

a source of program material;

means for determining a viewer preference;

means for receiving the program material from said source;

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means for storing the program material;

means for preprocessing the program material to produce a reduced data flow information signal retaining information relating to a character of the program material and eliminating data not necessary to characterize the program material;

means for characterizing said information signal based on its content;

means for correlating said characterized content of said information signal with said determined viewer preference to produce a correlation index; and

means for presenting said stored program material to the viewer, if said correlation index indicates a probable high correlation between said characterization of said information signal and said viewer preference.

22. The system according to claim 21, further comprising means for storing said information signal, wherein said characterizing means characterizes said stored information signal.

23. The system according to claim 21, further comprising a memory for storing the program material while said characterizing means produces characterized content and said correlating means produces said correlation index.

24. The system according to claim 23, further comprising means for storing a characterization of the program material, further comprising feedback means for inputting a feedback signal

from the viewer indicating a degree of agreement with said presented stored program material, wherein said feedback signal and said stored characterization are used by said viewer preference determining means to determine a new viewer preference.

25. A controller for controlling a plant, having a sensor for sensing an external event and producing a sensor signal, an actuator, responsive to an actuator signal, for influencing said external event, and a control means for receiving said sensor signal and producing an actuator signal, comprising:

means for inputting a program;

means for storing said program;

means for characterizing said sensor signal to produce a characterized signal; and

means for comparing said characterized signal with a pattern stored in a memory to produce a comparison index,

wherein said actuator signal is produced on the basis of said comparison index and said program, wherein said characterization comprises an Affine transformation of said sensor signal.

26. The controller according to claim 25, wherein said characterization comprises both an Affine transformation and a Fourier transformation.

27. A method for automatically recognizing digital image data consisting of image information, the method comprising the steps performed by a data processor of:

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storing a plurality of templates;

storing the image data in the data processor;

generating a plurality of addressable domains from the stored image data, each of the domains representing a portion of the image information;

creating, from the stored image data, a plurality of addressable mapped ranges corresponding to different subsets of the stored image data, the creating step including the substep of:

executing, for each of the mapped ranges, a corresponding procedure upon the one of the subsets of the stored image data which corresponds to the mapped ranges;

assigning identifiers to corresponding ones of the mapped ranges, each of the identifiers specifying for the corresponding mapped range a procedure and a address of the corresponding subset of the stored image data;

subjecting a domain to a transform selected from the group consisting of a null transformation, a predetermined rotation, an inversion, a predetermined scaling, and a predetermined frequency domain preprocessing;

selecting, for each of the transformed domains, the one of the mapped ranges which most closely corresponds according to predetermined criteria;

representing the image information as a set of the identifiers of the selected mapped ranges; and

selecting, from the stored templates, a template which most closely corresponds to the set of identifiers representing the image information.

28. The method according to claim 27 wherein the step of selecting the mapped ranges includes the substep of selecting, for each domain, a most closely corresponding one of the mapped ranges.

29. The method according to claim 27 wherein the step of selecting the most closely corresponding one of the mapped ranges includes the step of selecting, for each domain, the mapped range which is the most similar, by a method selected from one or more of the group consisting of selecting minimum Hausdorff distance from the domain, selecting the highest cross-correlation with the domain and selecting the highest fuzzy correlation with the domain.

30. The method according to claim 28 wherein the step of selecting the most closely corresponding one of mapped ranges includes the step of selecting, for each domain, the mapped range with the minimum modified Hausdorff distance calculated as $D[db, mrb] + D[1 - db, 1 - mrb]$, where D is a distance calculated between a pair of sets of data each representative of an image, db is a domain, mrb is a mapped range, $1 - db$ is the inverse of a domain, and $1 - mrb$ is an inverse of a mapped range.

31. The method according to claim 27, wherein the digital image data consists of a plurality of pixels each having one of a plurality of associated color map values, further comprising the steps of:

optionally transforming the color map values of the pixels of each domain by a function including at least one scaling function for each axis of the color map, each of which may be the same or different, and selected to maximize the correspondence between the domains and ranges to which they are to be matched;

selecting, for each of the domains, the one of the mapped ranges having color map pixel values which most closely correspond to the color map pixel values of the domain according to a predetermined criteria, wherein the step of representing the image color map information includes the substep of representing the image color map information as a set of values each including an identifier of the selected mapped range and the scaling functions; and

selecting a most closely corresponding stored template, based on the identifier of the color map mapped range, the scaling functions and the set of identifiers representing the image information.

32. The method according to claim 30 wherein the first criteria comprises minimizing the Hausdorff distance between each domain and the selected range.

33. The method according to claim 27, further comprising the steps of:

storing delayed image data, which represents an image of a moving object differing in time from the image data in the data processor;

generating a plurality of addressable further domains from the stored delayed image data, each of the further domains representing a portion of the delayed image information, and corresponding to a domain;

creating, from the stored delayed image data, a plurality of addressable mapped ranges corresponding to different subsets of the stored delayed image data;

matching the further domain and the domain by subjecting a further domain to one or both of a corresponding transform selected from the group consisting of a null transform, a predetermined rotation, an inversion, a predetermined scaling, and a predetermined frequency domain preprocessing, which corresponds to a transform applied to a corresponding domain, and a noncorresponding transform selected from the group consisting of a predetermined rotation, an inversion, a predetermined scaling, a translation and a predetermined frequency domain preprocessing, which does not correspond to a transform applied to a corresponding domain;

computing a motion vector between one of the domain and the further domain, or the set of identifiers representing the image information and the set of identifiers representing the delayed image information, and storing the motion vector;

compensating the further domain with the motion vector and computing a difference between the compensated further domain and the domain;

selecting, for each of the delayed domains, the one of the mapped ranges which most closely corresponds according to predetermined criteria;

representing the difference between the compensated further domain and the domain as a set of difference identifiers of a set of selected mapping ranges and an associated motion vector and representing the further domain as a set of identifiers of the selected mapping ranges;

determining a complexity of the difference based on a density of representation; and

when the difference has a complexity below a predetermined threshold, selecting, from the stored templates, a template which most closely corresponds to the set of identifiers of the image data and the set of identifiers of the delayed image data.

34. An apparatus for automatically recognizing digital image data consisting of image information, comprising:

means for storing template data;

means for storing the image data;

means for generating a plurality of addressable domains from the stored image data, each of the domains representing a different portion of the image information;

means for creating, from the stored image data, a plurality of addressable mapped ranges corresponding to different subsets of the stored image data, the creating means including

means for executing, for each of the mapped ranges, a procedure upon the one of the subsets of the stored image data which corresponds to the mapped range;

means for assigning identifiers to corresponding ones of the mapped ranges, each of the identifiers specifying for the corresponding mapped range an address of the corresponding subset of stored image data;

means for selecting, for each of the domains, the one of the mapped ranges which most closely corresponds according to predetermined criteria;

means for representing the image information as a set of the identifiers of the selected mapped ranges; and

means for selecting, from the stored templates, a template which most closely corresponds to the set of identifiers representing the image information.

